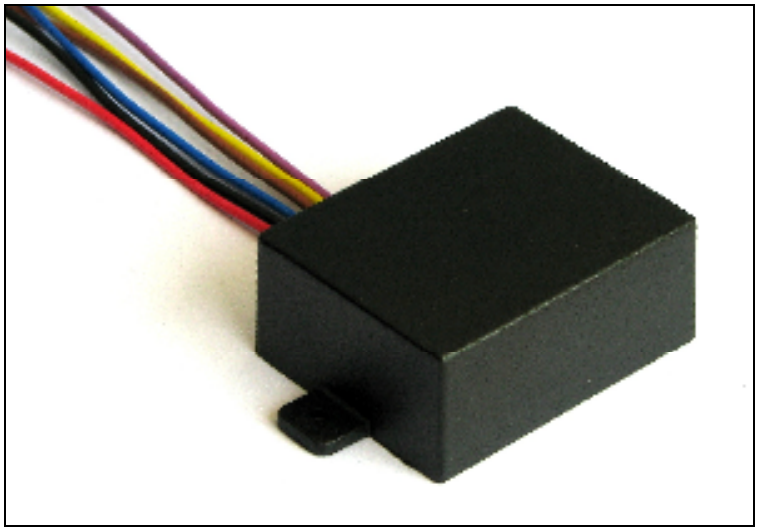
Cellocator Fuel Level Sensor (AR-0191)

Product Overview



Cellocator Division
Pointer Telocation Ltd.

Version 2.1

Revised and Updated: November 19, 2009

POINTER

Legal Notices

IMPORTANT

1. All legal terms and safety and operating instructions should be read thoroughly before the product accompanying this document is installed and operated.
2. This document should be retained for future reference.
3. Attachments, accessories or peripheral devices not supplied or recommended in writing by Pointer Telocation Ltd. may be hazardous and/or may cause damage to the product and should not, in any circumstances, be used or combined with the product.

General

The product accompanying this document is not designated for and should not be used in life support appliances, devices, machines or other systems of any sort where any malfunction of the product can reasonably be expected to result in injury or death. Customers of Pointer Telocation Ltd. using, integrating, and/or selling the product for use in such applications do so at their own risk and agree to fully indemnify Pointer Telocation Ltd. for any resulting loss or damages.

Warranty Exceptions and Disclaimers

Pointer Telocation Ltd. shall bear no responsibility and shall have no obligation under the foregoing limited warranty for any damages resulting from normal wear and tear, the cost of obtaining substitute products, or any defect that is (i) discovered by purchaser during the warranty period but purchaser does not notify Pointer Telocation Ltd. until after the end of the warranty period, (ii) caused by any accident, force majeure, misuse, abuse, handling or testing, improper installation or unauthorized repair or modification of the product, (iii) caused by use of any software not supplied by Pointer Telocation Ltd., or by use of the product other than in accordance with its documentation, or (iv) the result of electrostatic discharge, electrical surge, fire, flood or similar causes. Unless otherwise provided in a written agreement between the purchaser and Pointer Telocation Ltd., the purchaser shall be solely responsible for the proper configuration, testing and verification of the product prior to deployment in the field.

POINTER TELOCATION LTD.'S SOLE RESPONSIBILITY AND PURCHASER'S SOLE REMEDY UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE PRODUCT HARDWARE, SOFTWARE OR SOFTWARE MEDIA (OR IF REPAIR OR REPLACEMENT IS NOT POSSIBLE, OBTAIN A REFUND OF THE PURCHASE PRICE) AS PROVIDED ABOVE. POINTER TELOCATION LTD. EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, SATISFACTORY PERFORMANCE AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL POINTER TELOCATION LTD. BE LIABLE FOR ANY INDIRECT, SPECIAL, EXEMPLARY, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OR INTERRUPTION OF USE, DATA, REVENUES

OR PROFITS) RESULTING FROM A BREACH OF THIS WARRANTY OR BASED ON ANY OTHER LEGAL THEORY, EVEN IF POINTER TELOCATION LTD. HAS BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH DAMAGES.

Intellectual Property

Copyright in and to this document is owned solely by Pointer Telocation Ltd. Nothing in this document shall be construed as granting you any license to any intellectual property rights subsisting in or related to the subject matter of this document including, without limitation, patents, patent applications, trademarks, copyrights or other intellectual property rights, all of which remain the sole property of Pointer Telocation Ltd. Subject to applicable copyright law, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise), or for any purpose, without the express written permission of Pointer Telocation Ltd.

Table of Contents

1 General Description

1.1 Overview

The AR0191 Cellocator fuel level sensor supports all vehicles that utilize a resistive floating buoy.

The fuel sensor, when connected to the analog input of the Cellocator unit, enables fuel-monitoring in Fleet-Management applications. It connects to the analog fuel tank sender output, on the front end, and sends analog information of 0-2.5 Volts to the Compact's analog input as a linear function of the fuel level in the tank. The server-side software translates this information, as a visual indication of fuel level, perform fuel consumption calculations, and any other application layer activities.

1.2 Highlights

- Supports all vehicles that utilize resistive floating buoy.
- Supports vehicles with or without voltage regulator.
- Supports increasing or decreasing resistance as the fuel level varies.
- Supports simple calibration for full and empty tank.
- Supports filtering algorithm preventing measurements error due to buoy's momentary movement.
- Supports remote calibration.

1.3 Compatibility

The Fuel Level Sensor is compatible with any Cellocator unit utilizing an analog input.

1.4 Fuel Level Sensor Description

The fuel tank level sensor measures the fuel level in the vehicle tank. Its analog output provides a voltage which varies continuously between 0 V (empty tank) and 2.5 V (full tank).

The sensor features a very simple calibration process which supports all vehicles that utilize a resistive floating buoy. It is capable of handling the variations between floats provided in different vehicles. If the sender has an increasing or decreasing resistance as the fuel level varies, or if the voltage supply for the unit is regulated, the sensor’s output remains constant.

The sensor introduces very low-frequency, low-pass filtering, with cutoff below 0.05 Hz, in order to prevent movement of the float from inducing measurement errors.

The device is protected against inversion of power wires. It can also withstand having its output permanently shorted to ground or to any voltage in the range 0-10V.

The sensor is enclosed in a small, sealed ABS box and this ensures resistance to high ambient humidity. It is rated for a maximum temperature of 80ºC.

NOTE: The sensor can only work in vehicles with sending units which are continuously powered (as opposed to being powered via a pulsating source).

NOTE: The sensor properly measures the fuel level only when the fuel tank sender is powered. The sensor will indicate full or empty tank if the fuel tank sender is not powered.

2 Installation Instructions

The installation and calibration process may be completed manually as explained in Section 2.1, or the fuel sensor calibration can be done remotely (recommended) as explained in the Section 2.2.

2.1 Manual installation Instructions

2.1.1 Basic installation

Perform the following steps to install the Fuel Level Sensor.

1. Connect the sensor +V (wire 1, red) to the vehicle battery or to vehicle Ignition-On (recommended). The connection should be done using a fast blow, 1 A fuse to prevent damage to the vehicle's power in case of a faulty sensor.

NOTE: The sensor typically consumes 10 mA and therefore it is recommended to power the sensor via the vehicle's ignition switch, in order to extend battery life when the engine is off.

2. Connect the sensor GND (wire 2, black) to the vehicle GND.
3. Connect the Sender Input (wire 5, yellow) to the fuel tank's sending output.

NOTE: Voltage regulator adaptation must precede empty tank and full tank calibration.

2.1.2 Voltage regulator adaptation

Adapt the fuel sensor in cases where the vehicle has a voltage regulator to supply power to the fuel gauge/sending unit system, and in cases where a voltage regulator is not available. In order to do so, perform the following steps:

1. Turn the ignition switch to the Stand-By position. Do not turn on the engine. Wait for at least 10 seconds.
2. Short-circuit the regulator/setting by connecting the input (wire 6, purple) to the vehicle GND for more than 10 seconds.

NOTE: It is strongly recommended to use a switch with a pair of crocodile clips to ensure a stable connection.

3. Start the engine. Wait for at least 20 seconds.

NOTE: Do not turn the key to the off position or the process will have to be restarted.

4. Disconnect the short circuit (purple cable to Ground).
5. If remote calibration is planned, connect the regulator/setting input (wire 6, purple) to one of the Cellocator unit outputs. Otherwise this wire must be left free and insulated.

CAUTION: Under no circumstances should the regulator/setting input (wire 6, purple) be connected to any voltage above 5 V. The device will be permanently damaged if this happens.

NOTE: If you perform a voltage regulation adaptation, a complete empty and full tank calibration procedure must be performed as well.

2.1.3 Empty tank calibration

NOTE: The sequence of the calibration of the empty tank and the full tank is not important and can be performed in any desired order.

To perform calibration of the empty tank:

1. Empty the fuel tank or set the float to the "empty" position.
2. Turn the ignition switch to Stand-By position, to power up the float.
3. Wait at least 20 seconds to let the sensor's filter stabilize its output.

4. Short-circuit the calibration input (wire 3, blue) to the vehicle GROUND. Then remove the short circuit. The voltage on the output (wire 4, brown) should read 0 V.

2.1.4 Full tank calibration

NOTE: The sequence of the calibration of the empty tank and the full tank is not important and can be performed in any desired order.

To perform calibration of the full tank:

1. Fill the fuel tank or set the float to the "full" position.
2. Turn the car key to Stand-By position to power up the fuel float.
3. Wait at least 20 seconds in order to let the sensor's filter stabilize its output.
4. Short-circuit the calibration input (wire 3, blue) to the vehicle battery. Then remove the short circuit. The voltage on the output (wire 4, brown) should read 2.5 V.

2.1.5 Complete installation

1. Insulate the calibration input (wire 3, blue).
2. Connect the sensor's output to the Cellocator unit analog input.

2.2 Remote Calibration Instructions

In order to speed up the calibration process or to recalibrate the fuel sensor after installation has been completed, the fuel sensor can be calibrated remotely. The remote calibration requires coordination between the vehicle driver and the control center operator and it is the control center operator's responsibility to validate that all steps are carried out as required.

The remote calibration requires the following preparations:

1. The regulator indication input (wire 6, purple) should be connected to one of the Cellocator unit's outputs during the installation. The Cellocator unit should be programmed to supply ground to the output when activated.
2. The control center application allows activating and deactivating of the output.
3. The driver and the operator can carry out a phone call.

2.2.1 Voltage Regulation Adaptation

If voltage regulation adaptation is to be performed after the fuel sensor has been installed, perform the following steps:

1. Establish a phone call to the vehicle's driver.
2. Validate that the ignition switch is in Stand-By position and wait for at least 10 seconds.

3. Activate the output connected to the purple wire. Validate that an ACK is received from the Cellocator unit.
4. Wait more than 10 seconds and ask the driver to start the engine. Validate that the engine has been started and that the ignition was not turned off and wait for at least 20 seconds.
5. Deactivate the output and validate that an ACK is received from the Cellocator unit.
6. The voltage regulation adaptation process is completed.

NOTE: If you perform a voltage regulation adaptation, a complete empty and full tank calibration procedure must be performed as well.

2.2.2 Empty Tank Calibration

The process is initiated by the driver calling the operator when the fuel tank is empty. The operator performs the following steps:

1. Validate that the tank is completely empty.
2. Validate that the ignition switch is in Stand-By position. Wait for at least 20 seconds.
3. Activate the output connected to the purple wire for 2±0.1 seconds and validate that an ACK is received from the Cellocator unit.
4. The calibration process is completed.

2.2.3 Full Tank Calibration

The process is initiated by the driver calling the operator when the fuel tank is full. The operator performs the following steps:

1. Validate that the tank is completely full.
2. Validate that the ignition switch is in Stand-By position. Wait for at least 20 seconds.
3. Activate the output connected to the purple wire for 5 ±0.1 seconds and validate that an ACK is received from the Cellocator unit.
4. The calibration process is completed.

3 Technical Specifications

3.1 Electrical Specifications

Parameter	Description
Supply voltage	8 V - 36 V
Input range	Sending unit input: 0 V - 25 V Calibration input: 0 V - 36 V Regulator / setting input: Connected to GND or left free. Do not connect this input to any voltage above 5 V or the device will be permanently damaged.
Output range	0 V (empty tank) to 2.5 V (full tank). The device must be calibrated in order for these values to apply.
Frequency response	DC – 0.05 Hz
Current consumption	10 mA typical
Protection	The device will not be damaged if: • The power supply wires are connected with inverted polarity. • The output wire is shorted to ground or to any voltage in the range of 0-10V.

3.2 Physical Specifications

Parameter	Description
Dimensions	45mm x 35mm x 20mm (1.8 in x 1.4 in x 0.8 in)
Enclosure Material	ABS
Working Temp.	-30ºC to 80ºC
Wires length	25 cm (10 in)

3.3 Connection Table

Wire Name	Wire Number	Wire Color	Connection
+V	1	Red	Vehicle battery or ignition ON
GND	2	Black	Vehicle GND
Calibration input	3	Blue	According to installation instructions

Wire Name	Wire Number	Wire Color	Connection
Output	4	Brown	Cellocator unit analog input
Sender input	5	Yellow	Vehicle fuel tank sender
Regulator / setting input	6	Purple	According to installation instructions

3.4 Voltage Information in Cellocator Unit Messages

The *Cellocator* unit reports the measurement of an Analog input (containing the fuel level information) in each location update (message type 0, time event, input trigger, etc.).

The Analog reading is reported in the 4th byte of Analog Inputs (byte 29 of 70) with a resolution of 9.8mV per bit.

Listed below are examples of the message content:

- 0.6V will be reported as 0x3D
- 0.8V will be reported as 0x51
- 1V will be reported as 0x66
- 1.2V will be reported as 0x7A
- 2.4V will be reported as 0xF5

NOTE: If the fuel sensor power is connected to the ignition (as recommended), the application shall ignore the fuel sensor output on Ignition-Off.